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Title of the Invention

STORAGE SUB-SYSTEM AND MANAGEMENT PROGRAM

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STORAGE SUB-SYSTEM AND MANAGEMENT PROGRAM

BACKGROUND OF THE INVENTION

The present invention relates to control of a method for copying data from a main storage to a sub storage.

Control of a method for copying data of a storage area in storages is known as a technique holding data in multiple among two or more storages installed at remote locations in order to improve the reliability of data held in the storage area and to evade data loss resulted from a disaster such as a fire, an earthquake, and so on.

The technique as shown in Non-Patent Document 1 can realize data copy for each volume as a storage area by copy, not via a host computer, between two storages existing at remote locations and can quickly perform data transfer to a remote center with a disaster measure, relocation and integration of a data center so as to be independent from the host computer.

In a LAN (Local Area Network) and WAN (Wide Area Network) as a network connecting a plurality of host computers using a storage area, a user account exists as authentication information for accessing apparatuses on the network and the resource of an application.

With today's larger networks, user accounts are increasingly managed together with hierarchical

information on user belonging on a dedicated account management server. In addition, a dedicated storage area (home directory) for each user corresponding to a user account can be held on a volume in a storage .

When user account movement is performed on an account management server due to user's own transfer, home directory movement of the corresponding user on a volume is necessary with the movement.

In Non-Patent Document 2, with user movement on an account management server, home directory movement on a volume can be performed using a file copy function between host computers.

[Non-Patent Document 1]

"Hitachi TrueCopy realizing disaster recovery by remote copy", [online], the home page of Hitachi, Ltd., SANRISE series Technical Information/Technical Description, [searched on November 19, 2002], Internet &1t; URL: http://www.hitachi.co.jp/Prod/comp/storage/sanrise/techinfo/htc/index.html>

[Non-Patent Document 2]

"Integrated User Administration Assistant Software Soliton UserAdmin", [online], the home page of Soliton Systems K.K., Introduction of handled products, [searched on October 24, 2002], Internet &1t; URL: http://net.soliton.co.jp/products/soliton/useradmin/useadmin.html>

In Non-Patent Document 2 described above, with

user account movement, home directory movement of a targeted user on a volume in a storage can be performed between host computers, that is, via a LAN or WAN. Since it is not the movement not via a host computer in Non-Patent Document 1, processing in which host computers read out data occurs so as not to make copy processing with the movement faster. In addition, copy processing is executed using a network of a LAN or WAN connecting many kinds of computers. When the host computers execute other processing, the copy processing cannot be executed quickly, resulting in delay of the copy processing. Further, the load itself of the host computers themselves is increased due to the processing.

In the technique of Non-Patent Document 1, its copy unit is a volume unit. Its function cannot be used as user movement in home directory units. With user account movement, a function using a copy function to move a targeted volume cannot be realized.

SUMMARY OF THE INVENTION

An object of the present invention is to permit, with account movement, increase of the speed of data transfer of an exclusive storage area of a targeted account (a home directory of a user) and reduction of the load of a controller of a host computer.

A storage system according to an embodiment of the present invention has a storage and a controller. The storage has an interface for connecting it to a

storage of another storage system via a communication line, and a remote copy module transferring predetermined data to the storage of the another storage system via the communication line, not via the controller, based on a data transfer command from the controller. The controller has a remote copy control module transmitting, to the remote copy module, at reception of a notification of account movement from an account monitor module monitoring the change of an attribute with the account movement, a data transfer command for transferring predetermined data stored into the storage via the communication line to the another storage system.

A management program according to another embodiment allows a management computer to execute: a policy of receiving a notification of account movement from an account monitor module monitoring the change of an attribute with the account movement; and a policy of transmitting, at reception of the movement notification, to a storage system related as an account moving side, a data transfer command for transferring, to a storage system related as an account moved side, predetermined data stored into a storage via a communication line connecting the storages of the plurality of storage systems, not via the controller.

Other features of the present invention will be apparent from the description of this specification and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing an example of a storage system configuration according to an embodiment of the present invention;

Fig. 2 is a data structure diagram showing a file system structure of magnetic disk apparatuses in a storage system according to an embodiment of the present invention;

Fig. 3 is a data structure diagram showing the structure of a remote copy command issued from a remote copy control device of a file server of a local file server to a remote copy device of a storage in a storage system according to an embodiment of the present invention;

Fig. 4 is a data structure diagram showing difference information a remote copy control device of a local file server stores into its own control memory in a storage system according to an embodiment of the present invention;

Fig. 5 is a flowchart showing initial copy processing in a storage system according to an embodiment of the present invention;

Fig. 6 is a flowchart showing difference copy processing in a storage system according to an embodiment of the present invention;

Fig. 7 is a block diagram showing an example of a storage system configuration moving a home directory of

a user with user account movement according to an embodiment of the present invention;

Fig. 8 is a data structure diagram showing the structure of account management information owned by an account management server according to an embodiment of the present invention;

Fig. 9 is a flowchart showing home directory movement processing at user account movement according to an embodiment of the present invention;

Fig. 10 is a block diagram showing an example a storage system configuration moving a home directory of a user with user account movement according to an embodiment of the present invention;

Fig. 11 is a flowchart showing home directory movement processing at user account movement according to an embodiment of the present invention; and

Fig. 12 is a flowchart showing home directory movement processing at user account movement according to an embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A control function realizing copy of a storage area in a storage in file and directory units, not in the current volume units, as an assumption of this embodiment, will be described with Figs. 1 to 6.

Fig. 1 is a block diagram of assistance in explaining a system configuration of a method for copying data from a main storage to a sub storage . As

shown in the block diagram of Fig. 1, it has a local file server (system including a main storage) 100 and a remote file server (system including a sub storage) 200. A plurality of remote file servers 200 may exist with respect to one local file server 100. The servers 100, 200 are called NAS (Network Attached Storage) and have file servers (controllers) 110, 210 equivalent to host computers and storage 120, 220.

The file servers 110, 210 are connected to a communication network 300 such as a LAN or WAN via suitable communication interfaces 111, 211 such as a LAN interface. The communication network 300 is connected to computers (host apparatus and external apparatus) such as a client 400 and an account management server. Data is transmitted from the client 400 via the communication network 300 to the file server 110 of the local file server 100. The file server 110 transfers the received data to the storage 120.

The storage 120 of the local file server 100 and the storage 220 of the remote file server 200 are interconnected via a dedicated line called a fiber channel (communication line) 500.

The file server 110 of the local file server 100 has, as a hardware configuration, a control processor 116 integrally controlling the entire operation, a control memory 117 storing a program executed by the control processor and data, and a buffer 118

temporarily storing data. The file server 110 of the local file server 100 has a network file system 112, a local file system 113, and a remote copy control device 114 on a control memory 117, and an interface 115. The network file system 112 has a function executing data communication processing with the client computer 400. The local file system 113 has a function executing processing of transferring data transmitted from the client 400 via the interface 115 to the storage 120.

The network file systems 112, 212, local file systems 113, 213, later-described account management server monitors 119, 219, remote copy control devices 114, 214, and later-described file server performance monitors 131, 231 are program modules so that they are executed by the control processors 116, 216 to realize their functions. These modules may be stored into a recording medium (flexible disk, CD-ROM, DVD-ROM, semiconductor memory, transmission path such as a LAN or SAN) which can be read by the respective controllers. The functions of these modules may also be realized by a hardware configuration (semiconductor integrated circuit such as LSI (Large Scale Integration)).

The remote file server 200 has the same configuration and function as those of the above-described local file server 100. The file server 210 has the network file system 212, the local file system 213, and the remote copy control device 214 on a control memory 217, and an interface 215. The network

file system 212 has a function executing data communication processing with the client 400. The local file system 213 has a function executing processing of transferring data transmitted from the client 400 via the interface 215 to the storage 220.

The remote copy control device 114 on the local file server 100 side controls the remote copy device 122 of the storage 120. Specifically, a data transfer command requesting copy of data stored into the storage 120 to the remote file server 200 side is issued via the interface 115 to the storage 120.

The remote copy devices 122, 222 are program modules so that they are executed by control processors 126, 226 to realize their functions. These modules may be stored into a recording medium (flexible disk, CD-ROM, DVD-ROM, semiconductor memory, transmission path such as a LAN or SAN) which can be read by the respective controllers. The functions of these modules may be realized by a hardware configuration (semiconductor integrated circuit such as LSI (Large Scale Integration)).

The storages 120, 220 have interfaces 121, 221, the remote copy devices 122, 222, and magnetic disk apparatuses 123, 223, respectively.

The remote copy devices 122, 222 of the storages 120, 220 have, as a hardware configuration, the control processor 126 integrally controlling the entire operation, a control memory 127 storing a program

executed by the control processor and data, and a buffer 128 temporarily storing data. The remote copy device 122 on the local file server 100 side receives a data transfer command from the remote copy control device 113 of the file server 110 via the interface 121. The remote copy device 122 which has received the data transfer command reads out data from the magnetic disk apparatus 123 to transfer it via the dedicated line 500 to the storage 220 on the remote file server 200 side.

The remote copy device 222 of the storage 220 of the remote file server 200 receives the data transferred from the local file server 100 side to store it into the magnetic disk apparatus 223.

Fig. 2 is an example of a data structure diagram of a file system of the magnetic disk apparatuses 123, 223.

As shown in Fig. 2, the file system has a data management information area having volume label information 610, a meta-data area 620 and a directory entry area 630, and a real data area 640. The meta-data area 620 has a meta-data number 621, a file type 622, a size 623, access right information 624, final access time 625, final update time 626, and a plurality of data pointers 627. The directory entry area 630 includes a plurality of combinations of a meta-data number 631 and a file/directory name 632.

Fig. 4 is an example of a data structure diagram of difference information (information on updated data)

the remote copy control device 114 reads out from the control memory 117 and uses, in the local file server 100.

The difference information is stored as difference information when file update processing occurs from the client 400 to the local file server 100 during remote copy processing and when only necessary data, that is, only a necessary file and directory are remote copy processed from the local file server 100 to the remote file server 200. It is used when the remote copy control device 114 gives a remote copy command to the remote copy device 122 in later-described difference copy processing.

As shown in Fig. 4, file difference information 800 to files 1, 2, ..., is generally generated by the local file system 113. Each piece of the difference information 800 has a meta-data number 801, a plurality of meta-data block numbers 802, and a plurality of real data block numbers 803.

When remote copying only necessary data from the local file server 100 to the remote file server 200, in addition to the information created by the local file system 113, the remote copy control device 114 creates in a pseudo manner, as difference information of each of the files corresponding to unnecessary data, difference information in the form of Fig. 4 in which the targeted file is erased, so as to add the difference information to achieve the object.

Fig. 3 is the structure of a remote copy command that the remote copy device 122 of the storage 120 in the local file server 100 issues to the storage 220 in the remote file server 200.

As shown in Fig. 3, remote copy commands 700 consist of a plurality of grouped commands. Each of the commands 700 has a group number 701, a command number 702, a final flag 703, a block number 704, a size 705, and data (successive real data) 706.

In copy processing of one file, the remote copy control device 114 transfers the difference information shown in Fig. 4 to the remote copy device 122. The remote copy device 122 generates, based on the difference information, one or a plurality of commands given the same group number 701. The remote copy device 222 in the storage 220 executes writing of a series of the received commands into the magnetic disk apparatus 223 for each of the commands given the same group number 701.

Specifically, when receiving a plurality of commands given the same group number 701, writing into the magnetic disk 223 is not executed until all the commands given the same group number 701 reach the remote copy device 222. When the plurality of commands given the same group number 701 all reach the remote copy device 222, writing into the magnetic disk 223 is executed. The decision can be performed by checking whether the commands in which the command number 702 is

smallest and the final flag 703 is ON all reach the remote copy device 222. This can prevent a certain file from being written in an incomplete state into the storage 220 of the remote file server 200.

The remote copy processing of the storage system according to this embodiment will be described. In the remote copy processing, initial copy processing in which all file and directory data written into the local file server 100 are copied to the remote file server 200 is performed first. Subsequently, difference copy processing in which the file and directory data with occurrence of update from the client 400 to the local file server 100 is copied to the remote file server 200 is performed.

Fig. 5 is a flowchart of the initial copy processing according to this embodiment.

After start, the remote copy control device 114 (see Fig. 1) of the local file server 100 commands the remote copy device 122 (see Fig. 1) of the storage 120 to copy the volume label information 610 (see Fig. 2) (S10).

The remote copy control device 114 commands the local file system 113 to read out the meta-data 620. The local file system 113 transmits, to the remote copy control device 114, the physical position of the meta-data 620 and the physical position indicated by the data pointer 627 (see Fig. 2). The remote copy control device 114 stores the transmitted physical positions

(S20).

The remote copy control device 114 commands the remote copy device 122 to copy the meta-data 620 (S30). The remote copy device 122 transmits a command group as shown in Fig. 3 via the fiber channel 500 (see Fig. 1) to the remote copy device 222 of the storage 220 on the remote file server 200 side. The remote copy device 222 acquires data from the transmitted command group to store it into the magnetic disk apparatus 223.

The remote copy control device 114 commands the remote copy device 122 to copy the real data 640 (S40). The remote copy device 122 transmits a command group as shown in Fig. 3 via the fiber channel 500 to the remote copy device 222 on the remote file server 200 side. The remote copy device 222 acquires data from the transmitted command group to store it into the magnetic disk apparatus 223.

The remote copy control device 114 checks whether copy of all data files of the magnetic disk apparatus 123 (see Fig. 1) of the storage 120 of the local file server 100 to the magnetic disk apparatus 223 (see Fig. 1) of the storage 220 on the remote file server 200 side is executed (S50). After the checking, when copy of all the data files is completed, the initial copy is ended (S50: YES → End). When copy of all the data files is not completed (S50: NO), the processing from S20 is executed.

Fig. 6 is a flowchart of the difference copy

processing of the storage system.

After start, the remote copy control device 114 (see Fig. 1) of the local file server 100 acquires file information copied based on the difference information 800 shown in Fig. 4 from the control memory (S100). When copying only necessary data, the remote copy control device 114 creates, in the processing of S100, pseudo difference information in which an unnecessary file is erased.

A combination of block numbers 802, 803 (see Fig. 4) is transmitted from the acquired file information to the remote copy device 122 (see Fig. 1) of the storage 120 (S110). The remote copy device 122 reads out the corresponding data from the magnetic disk apparatus 123 (Fig. 1) based on the transmitted combination of the block numbers 802, 803 to generate a command group as shown in Fig. 3. The remote copy device 122 transmits the generated command group via the fiber channel 500 (see Fig. 1) to the remote copy device 222 of the storage 220 on the remote file server 200 side.

The difference information corresponding to the copied data is erased (S120). The remote copy device 222 acquires the data from the transmitted command group to store it into the magnetic disk apparatus 223 (see Fig. 1). The difference information is stacked each time file update occurs on the local file server 100. Data copy can be realized between the storage systems (from the main storage to the sub storage) by

continuing to execute the processing shown in Fig. 6. Copy of only necessary data can be realized in file and directory units between the storage systems, which is necessary in this embodiment.

There will be described a system configuration copying a home directory of a targeted user from the main storage to the sub storage on a user account management server at user account movement using the control function realizing copy of the storage area in the storage in file and directory units, not in volume units, which is described in Figs. 1 to 6.

Fig. 7 is a configuration diagram of a network system according to an embodiment of the present invention.

Basically, it has the same configuration as that of the block diagram of Fig. 1. A difference will be mainly described. In difference in configuration, it has an account management server 450 connected to the communication network 300, and the account management server monitors 119, 219 monitoring account management information of the account management server 450 on the control memories on the file servers 110, 210. The account management server 450 is a computer having the same hardware configuration as that of the file servers 110, 210 and has an output apparatus 457 displaying information and an interface 456 to the output apparatus 457.

The account management server 450 is a computer

managing account management information on a control memory 451. As suitable example of the account management server 450, an LDAP (Lightweight Directory Access Protocol) server is applicable.

The account management information includes information for authenticating an account used by the client 400 when using the file servers 110, 220 (user ID, application ID, and so on), an attribute for each account (information related to user belonging (the name of an enterprise, the name of a unit, and the position name/area name of the unit), information related to an application environment (server path, directory path, and so on), and information (ID) indicating the file servers 100, 200 storing data corresponding to the account.

Fig. 8 is an example of account management information according to an embodiment of the present invention.

As shown in Fig. 8, the account management information is managed as information of a hierarchical tree structure called a name service. The user account is defined as one element of the tree structure. The tree structure is generally defined as having a logical tree structure of a belonging unit in an enterprise and a physical tree structure of a position where the unit exists. When belonging movement of a user is performed, as shown in Fig. 8, the tree structure of the user account is moved on the account management server to be

moved to the tree structure in an optimum position as the user movement operation of a manager. In this case, the physical tree structure is also changed. With it, the login destination from the file server the user has used (logged in) to a new file server must be changed. Fig. 8 shows, as an image, movement assuming that user C (921) who has used the local file server 100 (903) existing under position A (901) and unit A (902) uses the remote file server 200 (913) existing under position B (911) and unit B (912) due to unit movement.

A user often owns a home directory as a storage area only for the user in a disk volume on a file server. With the file server movement, the manager must execute the home directory movement operation of the user C (921). Information of the home directory is managed by an account management device 452 of the account management server 450.

In this embodiment, there will be described, with the configuration of the block diagram of Fig. 7, a flow of specific processing of a method for executing the home directory movement operation at the user movement the manager has performed as a file copy function of the file server via the public line 300 using the control function of copy of the storage area in the storage in file and directory units, which is described in this embodiment.

Fig. 9 is a flowchart of home directory movement processing at user movement according to this

embodiment.

After start, the account management server monitor 119 on the local file server 100 monitors user movement with the account management information of the account management device 452 on the account management server 450 at fixed intervals (S210). The account management server 450 may notify account movement in a push type to the file servers 100, 200 on the moving side.

When user movement is performed (S210: YES), the routine is advanced to the next processing. When the movement is not found (S210: NO), S210 is repeated (S220).

When the user movement is found, the account management server monitor 119 acquires home directory information of a targeted user (in the example of Fig. 8, the user C (921)) and optimum file server information on the moved side (in the example of Fig. 8, the remote file server 200) from the account management device 452 (230).

Based on the acquired information, the account management server monitor 119 commands the remote copy control device 114 to control of copy of the file and directory on the home directory to the remote file server 200 on the moved side (S240). The copy processing itself is shown in Figs. 1 to 6.

The remote copy control device 114 executes erasing of the targeted home directory on the local

file server 100 on the moving side at the completion of final copy (S250).

In the above method, only the home directory of the moved user can be moved from the magnetic disk of the local file server 100 onto the magnetic disk of the remote file server 200, not via the public line 300, at user movement.

This embodiment is described with the target of account movement as a user. Needless to say, in another embodiment, account movement targeted includes all targets managed by the account management server. As another preferable example other than the user, with movement of the resource of an application, movement of a disk resource used by the application can be an application example of this embodiment. In this case, the user corresponds to the application, and information related to user belonging (the name of an enterprise, the name of a unit, and the position name/area name of the unit) corresponds to information related to an application environment (server path, director path, and so on). The system configurations and processing are the same. The description of the configuration and processing is omitted.

In this embodiment, related information of account attributes with IDs indicating the file servers 100, 200 storing data for each of the attributes is managed on the account management server 450. The related information may be provided in any one of the

modules of the file servers 100, 200 (the account management server monitors 119, 219, the remote control devices 114, 214, and the remote copy devices 122, 222). In this embodiment, when receiving a movement notification of an account attribute from the account management server 450, the modules specify the file servers 100, 200 to which data of the account of the moved attribute is transferred, based on the attribute on the moved side and the related information, to transfer the data of the account of the moved attribute to the specified file servers 100, 200. For data transfer, the modules transmit a data transfer command to the remote copy devices 122, 222. When the modules are the remote copy devices 122, 222 themselves, they perform data transfer by themselves.

There will be described a system configuration and a flow of processing executing movement of an exclusive storage area of the corresponding account after deciding movement or unmovement under a condition for movement selected by the manager and a performance condition on the moved side when moving the exclusive storage area of the corresponding account on the main storage to the storage area on the sub storage in file or directory units with movement of account management information managed by the account management server, which is described in this embodiment.

Fig. 10 is a block diagram of assistance in explaining a system configuration for deciding movement

of a home directory based on the transfer policy command of the manager when moving the home directory of the targeted user from the main storage to thc sub storage at user account movement on the user account management server, which is described as the first embodiment.

Basically, it has the same configuration as that of the block diagram of Fig. 7. A difference will be mainly described. In difference in configuration, there exist a management terminal 460 having the same hardware configuration as that of the account management server 450 connected to the communication network 300, a selection device for transfer policy 462, a decision device for transfer policy 463, a remote copy command device 468 and a performance information acquiring device 469 on a control memory 461 of the management terminal 460, and file server performance monitors 131, 231 monitoring performance information for each inner component of the file servers 100, 200 on the control memories 117, 217 on the file servers 110, 210.

The management terminal 460 is a computer used by the manger managing the configuration of Fig. 7 and includes a control processor 464 integrally controlling the entire operation, the control memory 461 storing a program executed by the control processor and data, and a buffer 465 temporarily storing data. The management terminal 460 has an output apparatus 471 providing an

output screen for receiving the transfer policy from the manager.

The selection device for transfer policy 462 is means in which the manager selects a condition related to copy movement of the home directory of a targeted user from the main storage to the sub storage at user account movement. As a condition about data transfer, there are considered a condition prohibiting data movement between the position of the file server on the moved side and the position of the file server on the moving side by a law such as the export control law and in-house rules, a condition permitting movement only when the distance between the file servers is longer than a predetermined reference, a condition permitting movement only when a belonging unit is different, and a condition permitting movement when I/O performance of the file server 100 on the moving side, load performance of the control processors 116, 126, 216 and 226, and network performance of the traffic and the number of packet lost of the interfaces are below a certain fixed value. The conditions described here are only examples. Needless to say, all information of condition selection about home directory movement of a targeted user is selected by the selection device for transfer policy 462.

The decision device for transfer policy 463 is means deciding whether copy movement from the main storage to the sub storage is permitted based on the

condition of home directory copy movement of a targeted user selected by the selection device for transfer policy 462. When the condition is not satisfied by the decision device for transfer policy 463, the copy movement processing of the home directory of the targeted user from the main storage to the sub storage is stopped.

When the processing is stopped, in order that the manager identifies the information, the information may be stored as log information into the storage of the management terminal 460, the information may be displayed on the output apparatus 471, or the information is notified to another apparatus.

When receiving a movement notification of an account attribute, the remote copy command device 468 commands the remote copy control device 114 of the local file server 100 on the moving side of the attribute to perform remote copy based on the decision result of the decision device for transfer policy 462.

The file server performance monitors 131, 231 are means acquiring and managing performance information of the local file server 100 and the remote file server 200. Specifically, they monitor I/O performance to the storages 120, 220, processor load factor performance of the control processors 116, 216, 126 and 226, and network performance of the traffic and the number of packet lost of the LAN I/F 111, 211 and the interfaces 115, 215, 121 and 221.

The control processor 464 of the management terminal 460 has the performance information acquiring module 469 acquiring performance information from the file server performance monitors 131, 231.

The selection device for transfer policy 462, the decision device for transfer policy 463, the remote copy command device 468, and the performance information acquiring module 469 are program modules in which they are executed by the control processor 464 to realize their functions. These modules may be stored into a recording medium (flexible disk, CD-ROM, DVD-ROM, semiconductor memory, and transmission path such as a LAN or SAN) which can be read by the respective controllers. The functions of the modules may be realized by a hardware configuration (semiconductor integrated circuit such as LSI (Large Scale Integration)).

In the system configuration of Fig. 10, there are shown two specific examples executing movement of the exclusive storage area of the corresponding account after deciding movement or unmovement based on the condition about data movement specified by the manager when moving an exclusive storage area of the corresponding account on the main storage to a storage area on the sub storage in file or directory units with movement of account management information watched by the account management server (Figs. 11 and 12).

Fig. 11 shows a processing example performing

decision based on position information between the local file servers according to this embodiment.

In Fig. 11, after start, the manager selects a condition about data transfer by the selection device for transfer policy 462 of the management terminal 460 (S310). There is given a condition permitting movement when the file server on the moved side is in a different position (in the example of Fig. 8, when the user C921 is moved from the position A901 below the position B 911).

The condition selected in S310 is stored into the decision device fro transfer policy 463 (S320).

The account management server monitor 119 on the local file server 100 monitors user movement with account management information of the account management device 452 on the account management server 450 at fixed intervals (S330). The account management server 450 may notify account movement in a push type to the file servers 100, 200 on the moving side.

When the user movement is executed (S330: YES), the routine is advanced to the next processing. When the movement is not found (S330: NO), S330 is repeated (S340).

When the user movement is found, the home directory information of the targeted user (in the example of Fig. 8, the user C (921)) and optimum file server information on the moved side (in the example of Fig. 8, the remote file server 200) are acquired from

the account management device 452 (S350).

The decision device for transfer policy 463 compares the information acquired in S350 with the condition selected in S310 to decide whether data movement is permitted (S360). When the data movement is not permitted after the decision (S360: NO), home directory movement is not executed (S390) to terminate the processing. The decision device for transfer policy 463 may decide whether data movement is permitted based on the information acquired in S350, the condition selected in S310 and the performance value acquired in the performance information acquiring device 469.

When the data movement is permitted after the decision (S360: YES), control of copy of the file and directory on the home directory to the remote file server 200 on the moved side is commanded to the remote copy control device 119 based on the information acquired in S350 (S370).

The copy processing itself is shown in Figs. 1 to 6. At the completion of final copy, erasing of the targeted home directory on the local file server 100 on the moving side is performed (S380) to end the processing.

Fig. 12 shows a processing example performing decision by the performance value of the local file server on the moved side.

In Fig. 12, after start, the manager selects the condition about data transfer in which movement is

permitted only when the performance value of the file server on the moved side (in the example of Fig. 8, the remote file server 200) is below a certain fixed value by the selection device for transfer policy 462 of the management terminal 460 (S410). Assume that a condition permitting movement when the processor load factor of the control processor 216 of the remote file server 200 is within 80% is given. Performance conditions selected in S410 include at least I/O performance to the storages 120, 220, processor load factor performance of the control processors 116, 216, 126 and 226, the traffic and the number of packet lost of the LAN I/F 111, 211 and the interfaces 115, 215, 121 and 221.

The condition selected in S410 is stored into the decision device for transfer policy 463 (S420).

The account management server monitor 119 on the local file server 100 monitors user movement with account management information of the account management device 452 on the account management server 450 at fixed intervals (S430). The account management server 450 may notify account movement in a push type to the file servers 100, 200 on the moving side.

When the user movement is executed (S430: YES), the routine is advanced to the next processing. When the movement is not found (S430: NO), S430 is repeated (S440).

When the user movement is found, the home directory information of the targeted user (in the

example of Fig. 8, the user C (921)) and optimum file server information on the moved side (in the example of Fig. 8, the remote file server 200) are acquired from the account management device 452 (S450).

Based on the information acquired in S450, the performance information acquiring device 469 acquires performance information of the file server on the moved side (in the example of Fig. 8, the remote file server 200) from the file server performance monitor 231 (S460).

The decision device for transfer policy 463 compares the information acquired in S460 with the condition selected in S410 to decide whether data transfer is permitted (S470).

When the processor load factor exceeds 80% after the decision (S470: NO), home directory movement is not executed (S500) to end the processing.

When the processor load factor is within 80% (S470: YES), control of copy of the file and directory on the home directory to the remote file server 200 on the moved side is commanded to the remote copy control device 119 based on the information acquired in S450 (S480).

The copy processing itself is shown in Figs. 1 to 6. At the completion of final copy, erasing of the targeted home directory on the local file server 100 on the moving side is performed (S490) to end the processing.

In the above method, based on the moving condition selected by the manager, only the home directory of the moved user can be moved from the magnetic disk of the local file server 100 onto the magnetic disk of the remote file server 200, not via the communication line 300, at user movement.

In this embodiment, the example comparing the moving condition as a single condition is given. Decision may be performed based on a plurality of moving conditions.

Also in this embodiment, the account management server monitors 119, 219 are configured in the file servers 100, 200, and may be configured in the management terminal 460.

According to this embodiment, with movement of account management information managed by the account management server, the exclusive storage area of the corresponding account on the main storage can be moved to the storage area on the sub storage in file or directory units. In copy processing with the movement, a dedicated line between storages without using the servers is used and executed. Processing of reading out data from the storage will not occur so that load can be reduced and the copy processing can be faster. The copy processing can be performed without using the communication network such as a LAN or WAN. When the servers perform other processing, copy processing can be executed quickly so that its delay will not occur.

The present invention permits, with account movement, increase of the speed of data transfer of the exclusive storage area of the targeted account (the home directory of the user) and reduction of the load of the controller of the host computer.